

Simple Spatial Analysis of Narcotics-Related Offenses in Malaysia

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ABSTRACT

Narcotics abuse crimes are just one among several types of dangerous crimes occurring in Malaysia, alongside sexual crimes, and commercial crimes. Despite an 11% decrease in the frequency of narcotics abuse crime cases and arrests from 2020 to 2021, the numbers still reached an alarming six-figure level. Using the dataset for narcotics abuse crimes, which includes distribution, possession and positive urine cases and arrests in 2022, descriptive, statistical and spatial analyses are presented. The analysis revealed that Malay male perpetrators aged between 20 and 60 dominate the number of arrests compared to other genders and races. It is also found that there is a significant difference in the age of the offenders based on genders and races. Besides that, it was found that the frequencies of cases and arrests for all offenses are correlated with the size of the population. The crime rate index based on the frequency of crimes, types of crimes and the current population is developed and presented as heatmaps. The heatmaps suggest that the top state with the highest crime rate index for distribution, possession, and positive urine offenses are Wilayah Persekutuan Kuala Lumpur, Pulau Pinang, and Terengganu respectively. The heatmaps serve as indicators in identifying which state has the highest crime rate index for narcotics abuse crimes in Malaysia in 2022.

Keywords: crime rate index, crime rate per capita, drug abuse, heatmaps; hotspots.

1 INTRODUCTION

Malaysia, like most countries, is not safe from narcotics crimes. A press statement released in 2022 mentioned that the frequencies of cases and arrests decreased significantly by 11% from 2020 to 2021 [1]. Despite the significant drop in the frequencies of cases and arrests, the frequencies are still alarmingly huge, reaching a six-figure number. Generally, narcotics abuse offenses can be classified into three categories: distribution of substances, possession of substances, and positive urine tests for substances. If the possessed substances reach over a certain weight threshold, the crime changes

from possession to distribution, according to Dangerous Drugs Act 1952. If caught, the punishment may vary based on the types of substance and/or the quantity of the substance. The United States Drug Enforcement Administration (US DEA) has its own scheduling system in which, the narcotics crimes are grouped by their potential for misuse and their medical uses. Drugs in Schedule I have the highest potential for misuse and no medical use, while those in Schedule V have the least potential for misuse and legitimate medical uses [2].

In Malaysia, perpetrators, if found guilty, may be fined, imprisoned, or punished on conviction with death, depending on the offense. Equivalent to the US DEA scheduling system, Malaysia operates under the Dangerous Drugs Act 1952, where Section 39 outlines the general and specific penalties on offenses related to narcotics abuse. The United Nations Office on Drugs and Crime (UNODC) has also discussed with National Anti-Drug Agency (NADA) in Malaysia on how to combat the narcotics problems in Malaysia, especially with the emergence of new psychoactive substance [3]. In March of 2023, Malaysian Minister of Home Affairs, Senator Datuk Seri Saifuddin Nasution Ismail had stated the importance of decriminalising the possession and the use of small amount of illicit drugs to avoid prison overcrowding [4], hence the introduction of a new Drugs and Substance Abuse Act bill. This move has already been described by UNODC almost a decade ago [5]. Besides reducing prison overcrowding, decriminalisation will reduce the court costs as well as increase uptake in drug treatments [5, 6].

The overarching aim of Sustainable Development Goal (SDG) Target 16: Peace, Justice and Strong Institutions is to foster global peace by mitigating various forms of crime, including violence, abuse, bribery, and others. This involves advocating for the establishment of rule-of-law frameworks at both national and international levels, ensuring equal access to justice for all, and actively working to decrease criminal activities. A recent special edition SDG 2023 report by the United Nations (UN) has disclosed that drug trafficking stands out as a significant contributor to illicit financial flows. Mexican drug cartels, during the period from 2015 to 2018, are estimated to have generated over \$12.1 billion, according to the findings [7]. Besides promoting safe environment for Malaysian communities, capturing the narcotics abuse crime offenders and confiscating the illicit drugs may boost the economy of Malaysia because less money can be expended on funding rehabilitation programmes, healthcare, and justice courts.

Aligning with the positive intent of SDG Target 16, this study aims to provide a spatial analysis of narcotics-related offenses to pinpoint crime hotspots and guide law enforcement in resource allocation. Specifically, we examine the distribution, possession, and usage patterns of narcotics across various states, considering demographic factors such as age, gender, and race in 2022. A bibliometric review of spatiotemporal narcotics research has highlighted a notable imbalance in such analyses worldwide, with only small works in the Malaysian context, underscoring the need for studies of this nature [8]. Furthermore, Department of Statistics Malaysia [1] usually presents the narcotics abuse crime in percentage so this paper employs crime rate index as an alternative to present the narcotics abuse crime data visually and informatively.

This article is organized as follows. Section 2 will explain on the narcotics abuse crime data and its distributions by age, gender, and race as well as some trendlines of the offenses. Section 3 will develop and utilize crime rate index statistics to present heatmaps for different offenses. Section 4 will conclude the study and provide future direction of the study.

2 DATA AND METHODOLOGY

The narcotics abuse crime data is obtained from the Narcotics Crime Investigation Department of Royal Malaysia Police. The data majorly consists of narcotics cases and arrests as well as some information on the background of the offenders and the types of narcotics seized. The dataset includes records of arrests, categorized by age, gender, race, and type of offense. While the dataset provides comprehensive coverage of the incidents, it may not capture unreported cases, leading to potential underestimation of the true extent of narcotics abuse. This is a known challenge in crime data, as the estimation of hidden or unreported offender populations remains methodologically complex, addressed in many works (see [9-15]).

Histograms are developed to visually discern any differences in the frequency of arrests based on age, race and gender. Correlation analysis is conducted to investigate the relationship between the frequency of arrests and cases for each type of offences with the population size of states in Malaysia. Independent t-tests and two-way ANOVA were selected to analyse age differences among offenders based on gender and race, due to their robustness in comparing means across groups. Heatmaps were chosen to visually represent crime rates across different states, offering intuitive insights into spatial patterns of narcotics offenses.

3 FINDINGS I – DESCRIPTIVE AND STATISTICAL ANALYSIS

This section presents the descriptive and statistical analyses of the narcotics abuse crime data for 2022, examining the demographic profile of offenders and testing for significant differences in age across gender and race.

3.1 Descriptive Statistics for the Narcotics Abuse Data 2022

The arrests data consists of 152,374 offenders, of which 145,625 are males and 6,749 are females. This includes 109,938 Malays, 11,489 Chinese, 13,131 Indians, 20 foreigners and 17,796 from other races. Other races include those from indigenous people in Malaysia as well as those which are unaccounted for. Most offenders are between 20 and 50, as presented in Figure 1.

Fig. 2 shows the arrest frequency distributions of the races of the offenders based on their genders. From Fig. 2, it is evident that there are more male offenders than female offenders arrested for the narcotics abuse crime. Besides that, male offenders who are Malay, tend to get involved and arrested for narcotics abuse crime far more than those who are Chinese and Indian.

Further delve into the distribution of the arrests based on the races, the genders and the age of the offenders has revealed an interesting outlook, which is presented in Fig. 3. From Fig. 3, male offenders are usually older than the female offenders, as statistically confirmed in Section 2.2. Besides that, male offenders who are Malays, dominate the number of arrests due to narcotics abuse crime in Malaysia. The age distribution for female offenders is between 20 to 30 and a cross-sectional studies conducted a decade ago by Ibrahim, Zakaria [16] concluded that most offenders from the study started misusing the drugs from the age between 15 to 26 years old and have succumbed to addiction for about 1 to 6 years. This raises an alarming question if the trend of narcotics abuse by female has not changed in a decade. This is also worrisome because Malays, are referred as people who follow

the teachings of Islam, practice the Malay cultural customs, and speak in Malay¹. The prohibition of narcotics usage is clear in the teachings of Islam as well as in Malay culture and yet, most narcotics abuse crime offenders are Malays.

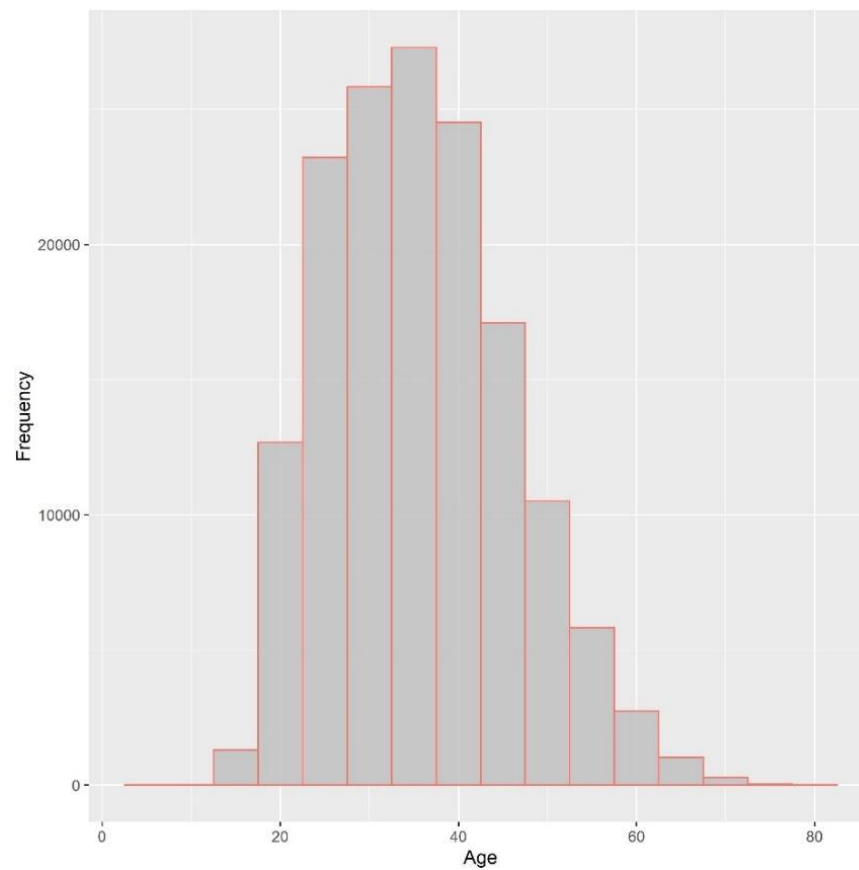


Figure 1 : Histogram of age of the offenders

¹ Article 160 of the Federal Constitutions (amendment) Act 2022.

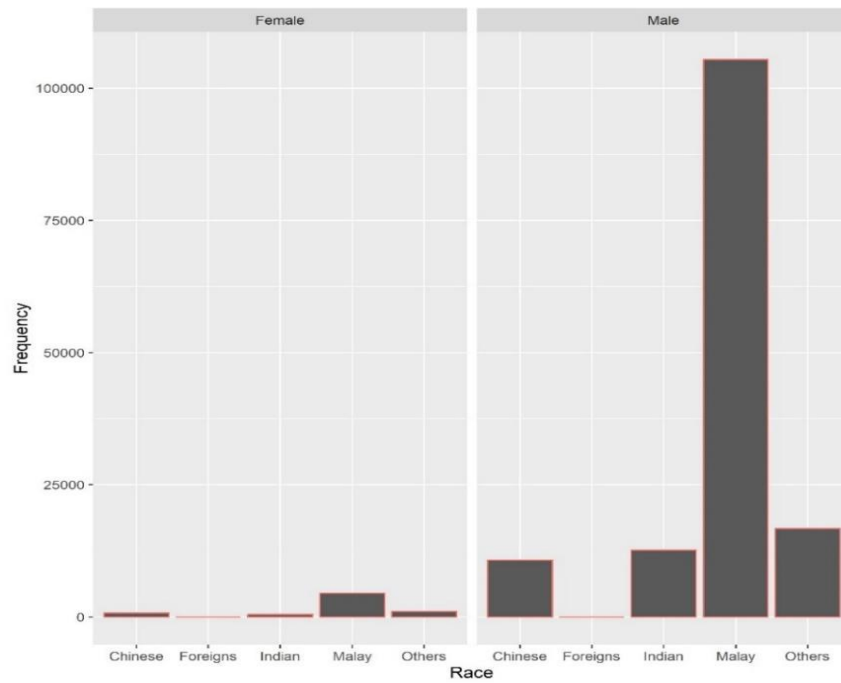


Figure 2 : Distribution of frequency of arrests by race and gender. “Others” race refers to indigenous people in Malaysia as well as other unaccounted races

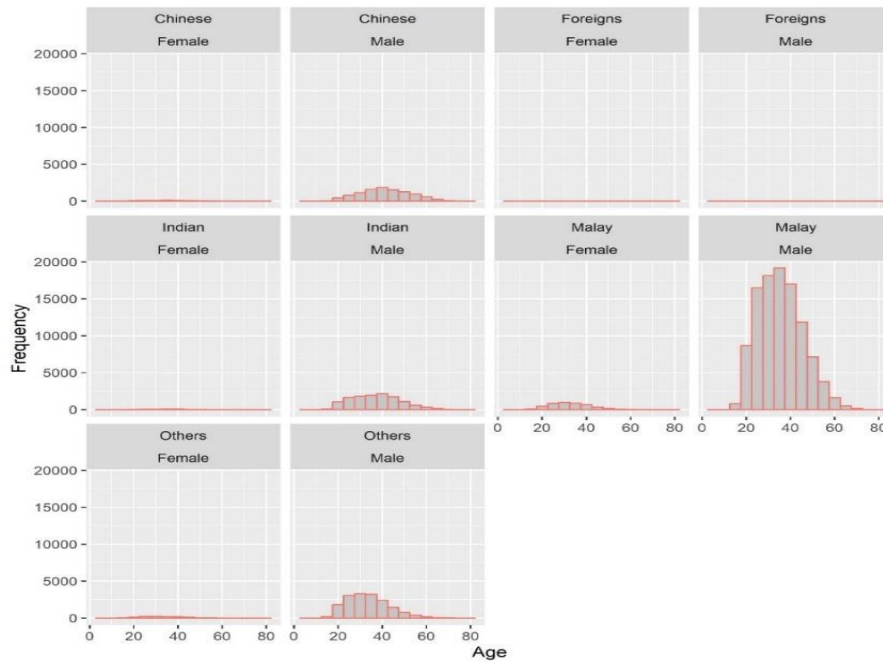


Figure 3 : Distribution of frequency of arrests by race, gender, and age. “Others” race refers to the indigenous people in Malaysia as well as other unaccounted races

3.2 Correlation Analysis

It is informative to know if the population size correlates with the frequencies of narcotics abuse cases and arrests. Pearson correlation coefficient, r_{CP} between the population size and the frequencies of cases and arrests is defined as:

$$r_{CP} = \frac{\sum_{i=1}^{14} (C_{ij} - \bar{C}_i)(P_{ij} - \bar{P}_i)}{\sqrt{\sum_{i=1}^{14} (C_{ij} - \bar{C}_i)^2} \sqrt{\sum_{i=1}^{14} (P_{ij} - \bar{P}_i)^2}} \quad (1)$$

where C_{ij} and P_{ij} refer to frequency of cases or arrests and population size for state j and offence i , respectively, $\bar{C}_i$ and $\bar{P}_i$ are the marginal sample mean of C_{ij} and P_{ij} over state j and offence i . The r_{CP} values are presented in Table 2. From Table 1, the possession cases and arrests as well as total cases and arrests are found to be highly correlated with the population size of the states whereas, the distribution cases and arrests as well as positive urine cases and arrests are found to be only moderately correlated with the population size of the states. In summary, the denser the population, the higher the narcotics crime activities. Specifically, the strong correlation between population density and possession cases and arrests suggests that more densely populated areas face greater challenges in controlling narcotics possession crimes.

Table 1 : Correlation values between offenses and population size

i	Offense	Correlation with Population Size
1	Distribution cases	0.4865
2	Distribution arrests	0.5808
3	Possession cases	0.8009
4	Possession arrests	0.8027
5	Positive urine cases	0.3023
6	Positive urine arrests	0.3009
7	Total cases	0.7743
8	Total arrests	0.8154

3.3 Statistical Tests

Two tests were conducted to investigate the similarities in the age of the offenders based on race and gender. The first test investigates the similarities in age between male and female offenders. Null and alternative hypotheses for a simple independent t -test in checking whether the mean population age between male, $\mu_{age,male}$ and female, $\mu_{age,female}$ are equal are respectively given as:

$$H_0: \mu_{age,male} = \mu_{age,female} \quad H_1: \mu_{age,male} \neq \mu_{age,female},$$

which has revealed that there is a significant difference in the mean population age between male and female based on the t statistics of -23.241, degrees of freedom of 7532 and p-value less than 0.05.

The second test, a two-way ANOVA test was conducted to observe any difference in the age of offenders by incorporating both gender and race. The result of the test is tabulated in Table 2. From Table 2, there are significant differences in population age for genders and races for the narcotics crime offenders in Malaysia.

Table 2 : A two-way ANOVA test

	Degrees of Freedom	Sum of Squares	Mean Squares	F Value	p-Value
Genders	1	47 304	47 304	463.90	< 0.0001
Races	4	457 564	114 391	1121.80	< 0.0001
Residuals	152 368	15 537 788	102		

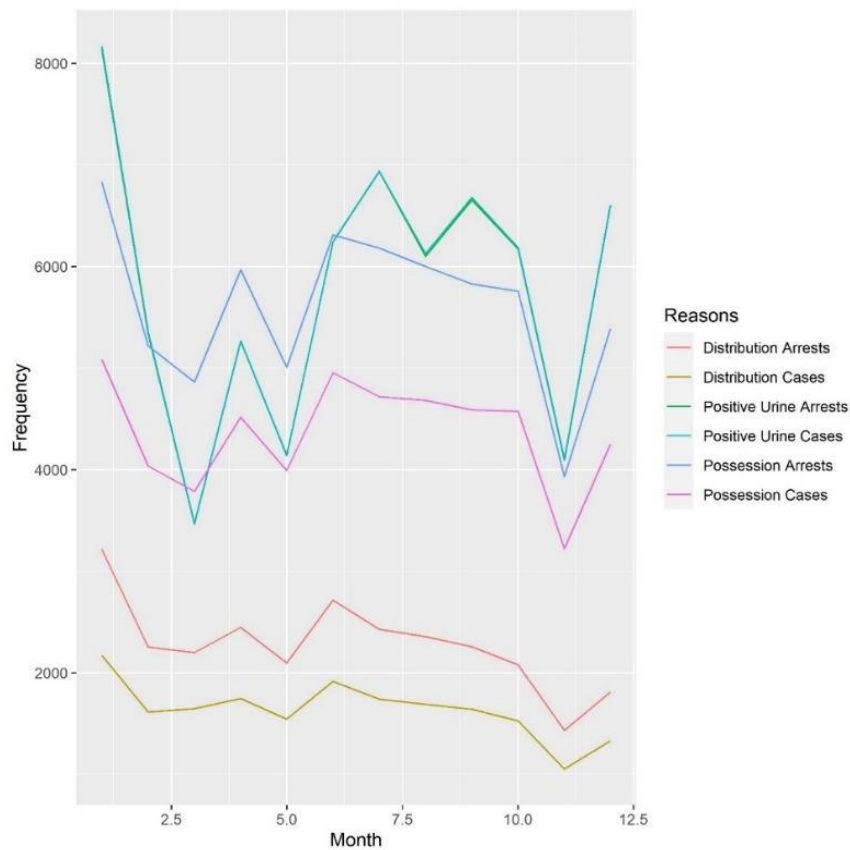


Figure 4 : Trendlines of cases and arrests for each offense using monthly aggregated data

Fig. 4 illustrates the trendlines of monthly aggregated cases and arrests from January 2022 until December 2022. It can be noted that the narcotics abuse crime in Malaysia are predominantly contributed by possession and positive urine tests cases and arrests. These suggest that most offenders use the drugs for themselves or in a small quantity. Regarding positive urine tests, it is possible that the offenders went to neighbouring countries where narcotics are not illegal or can be obtained easily than in Malaysia, used the narcotics and got caught at the point of entries to Malaysia such as customs in airport or border checkpoints.

4 FINDINGS II – SPATIAL ANALYSIS

Identifying the states that are prone to narcotics abuse crime is very crucial to the government so that the appropriate resources such as financial aids as well as the manpower, can be allocated to those states to combat this crime effectively and efficiently. Prior spatial crime studies in Malaysia have demonstrated the utility of such geographic identification in informing law enforcement strategies [17-20].

4.1 Heatmaps using Crime Rate Index

Crime rate index, which is read as per 100,000 population, is used to standardize the frequency of the cases and arrests with respect to the size of current population, which is defined as:

$$CR_{ij} = \frac{C_{ij}}{P_{ij}} \times 100,000 \quad (2)$$

where CR_{ij} refer to the crime rate index for state j and offence i . This crime rate index is also known as the crime rate per capita and described as the simplest hotspots detection tool for narcotics abuse crimes [21, 22]. The crime rate index is converted to spatial data and presented as heatmaps, illustrated in Fig. 5 to Fig. 12. The heatmaps are developed in Microsoft Excel, powered by Bing © GeoNames, Grab grab.com, Microsoft and TomTom.

Fig. 5 and Fig. 6 show that most narcotics distribution cases and arrests primarily happen in Wilayah Persekutuan Kuala Lumpur and Kedah. The socio-economic conditions in these regions, including high population density and greater availability of nightlife venues, may contribute to these patterns, especially in Wilayah Persekutuan Kuala Lumpur, which is supported by Zhang, Balles [23]. If the anti-narcotics raid operation was conducted onto the nightclubs, each and everyone in the club will be booked for distribution of narcotics and further investigations will be conducted. It could also be explained by the fact that Kuala Lumpur and Selangor are in one of the most important trafficking routes of narcotics in Southeast Asia. Besides that, the Royal Malaysia Police officers are advised to investigate this matter and identify any illegal narcotics trafficking routes in Wilayah Persekutuan Kuala Lumpur and Kedah such as International Airport or Port Klang where there is a possibility of import and export of narcotics in cargo.

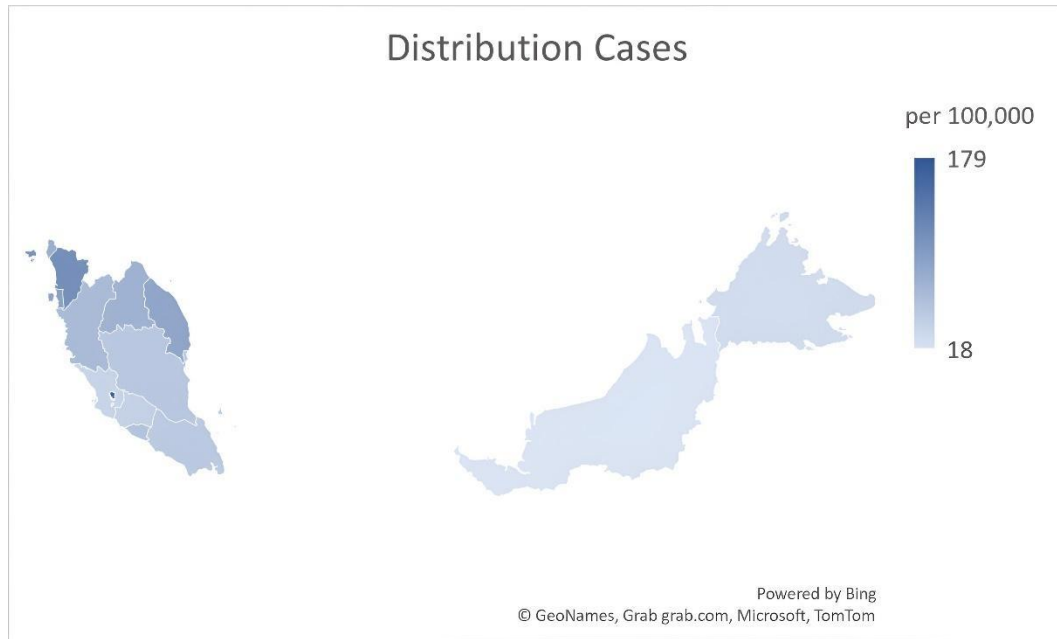


Figure 5 : Heatmaps for crime rate index for distribution offense cases

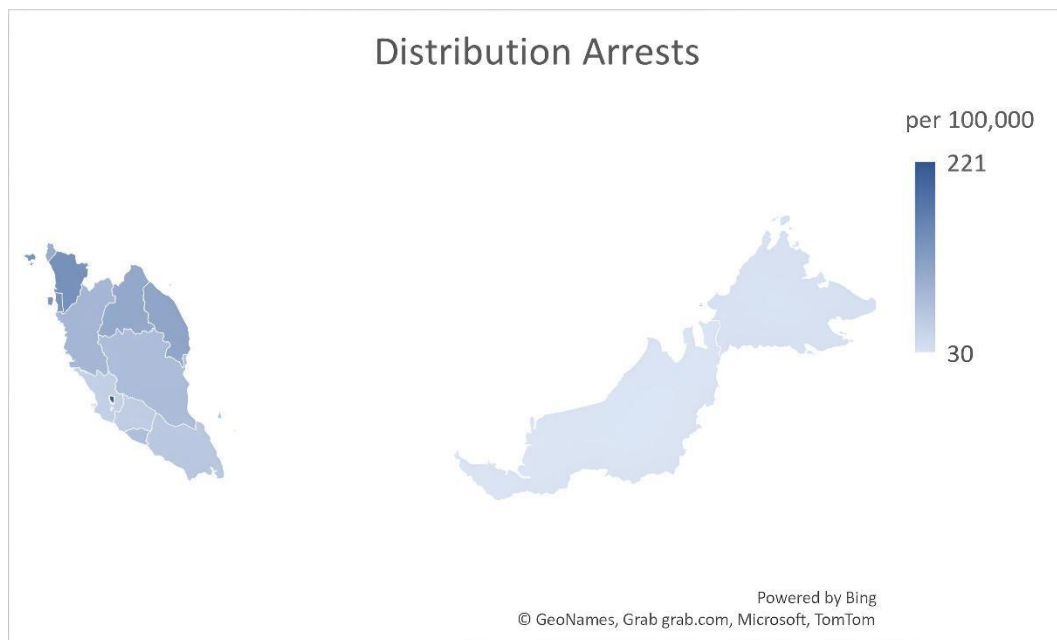


Figure 6 : Heatmaps for crime rate index for distribution offense arrests

Besides that, most narcotics possession cases and arrests can be traced to Pulau Pinang and Perlis, as visualized in Fig. 7 and Fig. 8. Both Pulau Pinang and Perlis are located very close to the beach and ocean, so it may be possible for a syndicate which supplies narcotics in small quantities to entertainment outlets and private parties at luxury condominiums.



Figure 7 : Heatmaps for crime rate index for possession offense cases



Figure 8 : Heatmaps for crime rate index for possession offense arrests

For positive urine cases and arrests, it is found from Fig. 9 and Fig. 10 that Terengganu and Pahang dominate the number. It is important to note that if a person is found guilty three times, that person will have to face heavier punishment than mere fine.

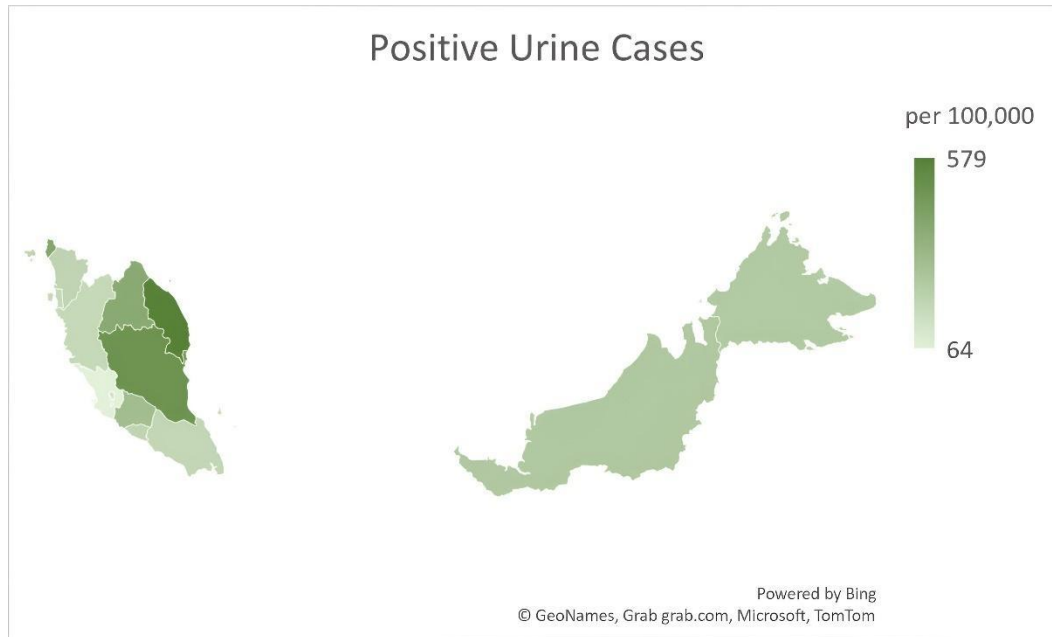


Figure 9 : Heatmaps for crime rate index for positive urine offense cases

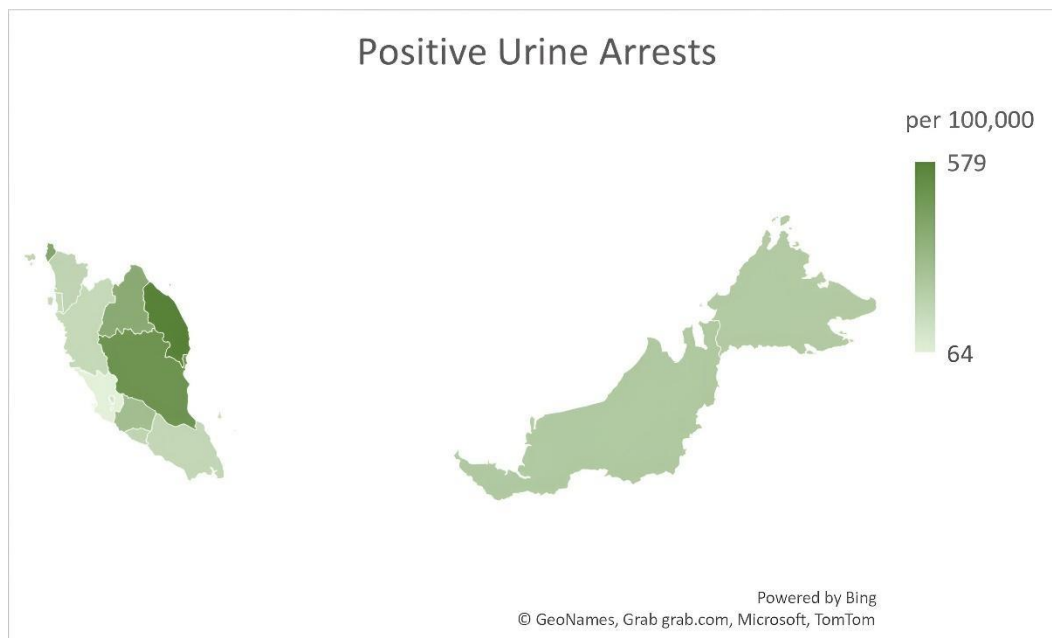


Figure 10 : Heatmaps for crime rate index for positive urine offense arrests

Fig. 11 and Fig. 12 show the heatmaps for overall cases and arrests, respectively. In overall, most narcotics abuse cases and arrests happen in Terengganu, Perlis, and Kelantan. Surprisingly, despite being two largest states in Malaysia, Sabah and Sarawak have minute crime rate index for all offenses. Following these two states are Selangor and Johor.

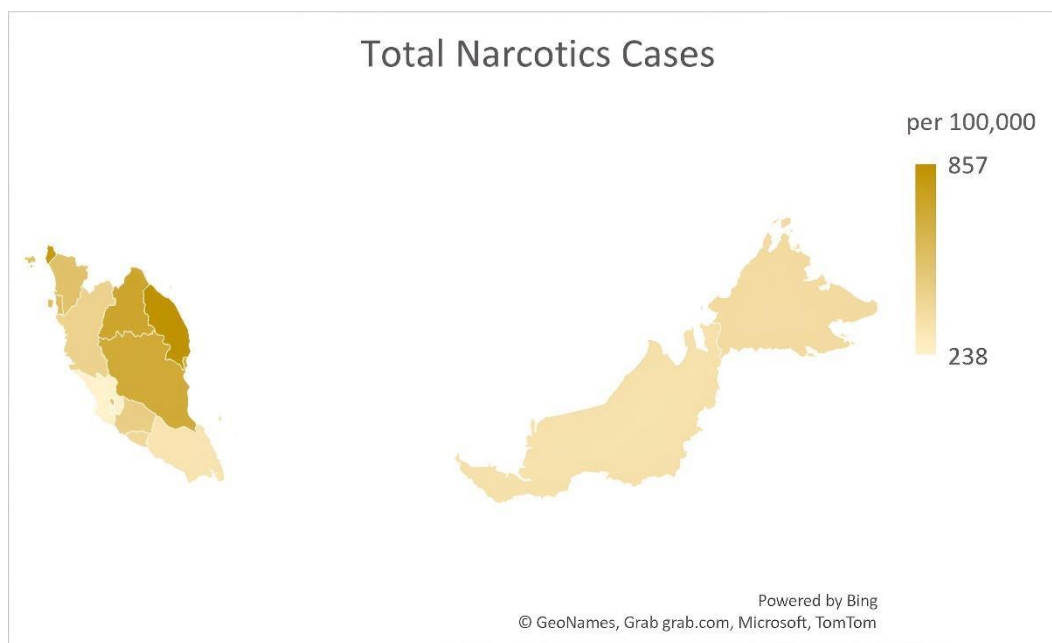


Figure 10 : Heatmaps for crime rate index for total narcotics cases

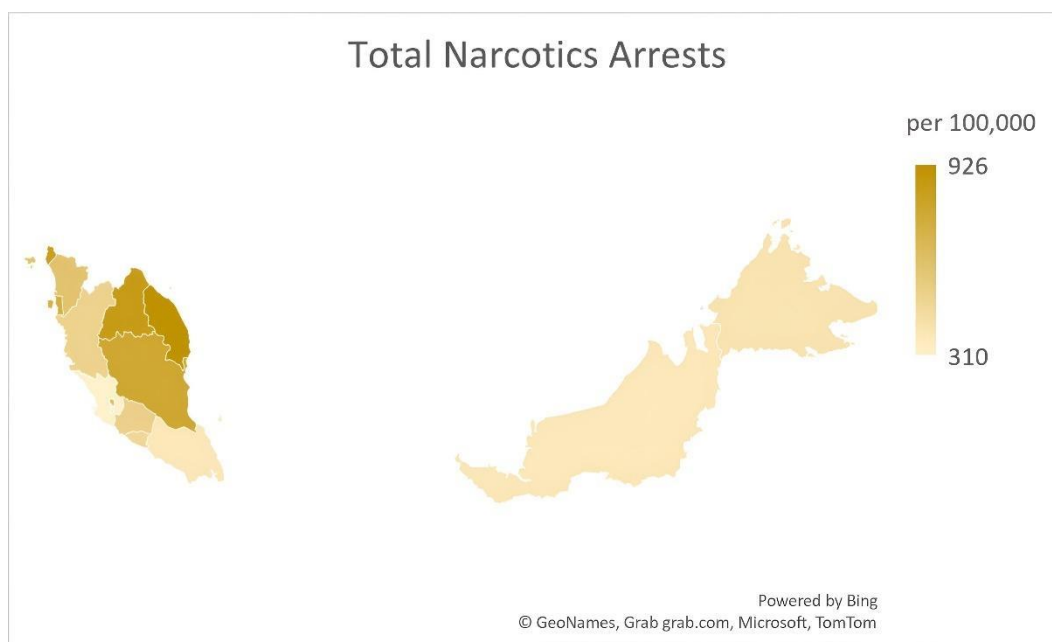


Figure 12 : Heatmaps for crime rate index for total narcotics arrests

5 CONCLUSION

Malaysia is no stranger to narcotics abuse crimes, and this study reveals that the frequency of cases and arrests for all types of offenses – distribution, possession, or positive urine test – correlates with

the population size of states in Malaysia. Furthermore, the spatial analysis conducted on the narcotics abuse cases and arrests has unveiled some important points. Narcotics distribution offense mostly happens in Wilayah Persekutuan Kuala Lumpur and Kedah. Next, narcotics possession offense mostly happens in Pulau Pinang and Perlis. Finally, most positive urine offense happens in Terengganu and Pahang. The Narcotics Crime Investigation Department of Royal Malaysia Police are advised to consider and incorporate the information presented here whether in engaging anti-narcotics operations or comparing year-over-year to get better allocation of resources according to the size of the states in Malaysia.

Numerous initiatives can be considered to further combat narcotics abuse crime in Malaysia. This includes developing and implementing targeted community outreach programs in high-risk areas which promote healthy lifestyle and drug use prevention techniques to mitigate the prevalence of narcotics distribution. Besides that, more drug treatment programs and rehabilitation centers can be established and launched for easy access to treatments by the addicts.

Future studies may benefit from incorporating a wider range of contextual factors beyond the demographic variables examined here. These may include individual-level factors such as early exposure to drugs, stress, and family influences, as well as broader socioeconomic conditions such as poverty and unemployment, and environmental factors such as urbanisation and housing conditions. Investigating these factors alongside the spatial and demographic patterns identified in this study may yield a more comprehensive understanding of narcotics abuse in Malaysia.

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